

On some Structures liable to Variation in the Subfamily Astrangiaceæ (Madreporaria). By STUART O. RIDLEY, M.A., F.L.S., Assistant in the Zoological Department, British Museum.

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(PLATE XVI.)

IT is one of the chief functions of Zoology (as distinguished from Comparative Anatomy) to bring together the (essentially) like and to separate the (essentially) unlike. The question, What constitutes essential similarity and dissimilarity? is one of the earliest problems which confront the zoologist, and, if not satisfactorily solved, will prove a stumbling-block at every turn; it is, moreover, as applied to the lower terms of our classification, viz. genera and species, a question with which *à priori* considerations have very little to do, and which can only be satisfactorily solved, as a rule, by study of a tolerably extensive series of the very genera and species to which the problem is to be applied.

Perhaps in no group is it more necessary to bear these facts in mind than in the Madreporarian Corals. The constantly decreasing value placed upon certain structures, viz. tabulæ, cœnenchyma, and epitheca, and upon the number 6 as an index to the septa for group-distinction, illustrates the truth of this. In the families Turbinoliidæ and Oculinidæ the characters derived from the presence or absence of the numbers of the pali, from the structure of the columella, and (but to a less extent) the condition of the costæ, form leading points for generic and specific diagnosis. In that group of the great family Astræidæ, as at present constituted (Milne-Edwards and Haime), which probably shows the closest general resemblance to these families, viz. the Astrangiaceæ, the columella, costæ, and pali form lobes representing physiologically the pali, inasmuch as they frequently exhibit a similarly advanced development, and have been naturally resorted to for purposes of classification*. But the object of this paper is to show that, whatever may be the value for classification of the corresponding parts in the Turbinoliidæ and Oculinidæ, they must be employed with great caution in the zoological study of the Astrangiaceæ.

* See Duncan, Proc. Zool. Soc. 1876, p. 439; Verrill, Bull. Mus. Comp. Zool. i. p. 47, Trans. Conn. Acad. i. p. 525 *et seq.*; Milne-Edwards and Haime, Hist. Nat. Cor. ii. pp. 606-620.

The facts on which I base this argument will be found in the following descriptions of two species of *Phyllangia*. I had been led to examine these species closely for the purpose of identifying some specimens lately added to the national collection; I found that they were somewhat "critical" species, and that one of them was incorrectly identified in the collection; and that, further, certain of the characters on which stress had been previously laid by describers of species proved remarkably unstable. For these reasons I now give descriptions of two series of specimens illustrating these two species.

PHYLLANGIA PAPUENSIS, *Studer*. (Plate XVI. figs. 5-10.)

Phyllangia papuensis, *Studer*, *MB. Ak. Berlin*, 1877, p. 642.

The specimens consist of fragments detached from an old anchor at Amboyna by Mr. H. O. Forbes, and presented by him to the British Museum. Studer's description of specimens from the Solomon Islands differs from them in a few points, viz. the inferior diameter of the calicles (4-5 millim., the largest of the present series examined is 7 millim.), and the "small" paliform lobes. He describes the columella as small, consisting in some cases of only one to three short pillars.

In the Amboyna specimens the basal stolon is moderately thick, the corallites are 8-9 millim. in greatest height, the primary septa in large calicles rise 1 millim. above the wall of the cup; it is the largest calicles which have the thinnest primaries; septa of a fourth cycle may be present on one side of some systems of a calicle. The central (columellar or pseudo-columellar) mass is usually composed of *one* roughly pointed, prominent, central column (the columella s. str.), and of six to ten erect similar paliform lobes arising from the inner margins of the primary and some secondary septa, and of subjacent contort, rather coarse trabeculæ uniting them to the columella: these trabeculæ may (i.) either be evident from above, the paliform lobes and columella forming inconspicuous points on their upper margins, or (ii.) these structures may project boldly from the trabeculæ, or (iii.) the trabeculæ may be disguised and the spaces between them concealed by the extension between the trabeculæ, lobes, and columella of a calcareous lamina, uniting the whole into a dome from which the lobes and columella arise as pinnacles (see figs. 7-9).

The costæ are broad, flat, subequal, and granular, and extend in bold sweeping curves, sometimes rising into quite prominent

ridges and bending at sharp angles between the calicles. The calicles are circular or slightly subcircular, maximum diameter 7 millim. Tertiary septa dentate above; all septa with approximately vertical inner margin; surfaces of the first three orders in a few cases sparsely and finely granular.

Increase of the colony takes place by gemmation, either (*a*) from the sides of older corallites, the interseptal cavities of the older and younger being (in some cases at any rate) in communication; (*b*) from the basal stolon (see fig. 10).

I would call special attention to (1) the variability of the central columellar mass in large corallites from (i.) a continuous dome-like calcareous mass from which the columellar pillar and the pali-form septal lobes rise prominently, to (ii.) a spongy aggregation of plicate laminæ, the upper margins of which are scarcely resolvable into distinct columellar columns and pali-form lobes; in other words, *from the papillose to a trabecular type*; and (2) to the variation in the source of the gemmation, viz. from the stolon to the sides of the calicles; M.M. Milne-Edwards and Haime state that in this group the former mode alone obtains. Verrill (*Tr. Conn. Ac. i. p. 525*) has already pointed out that in *Astrangia* both methods occur.

PHYLLANGIA DISPERSA, Verrill, var. (Plate XVI. figs. 1-4.)

Phyllangia dispersa, Verrill, *Bull. Mus. Comp. Zool. i. p. 47*; *Trans. Conn. Acad. i. p. 532*.

In a specimen coating the umbonal region of a bivalve shell from deep water, Malacca, in the National collection, the common basal lamina is thin; in one case a good-sized corallite rises from the lamina in such a way that the wall is continued by a gradual curved sweep into the lamina, on to which some of the costæ are faintly continued; the remaining corallites rise abruptly from the lamina, and the costæ can rarely be distinctly made out to be continued on to the lamina. Although some of the calices are of fair size, viz. 5.5 millim. in the greater diameter, this wall is very thin, and the maximum height is only 4.5 millim. The calicles vary from a circular to an elliptical form, the disproportion of the axes in the latter reaching as much as 11:9; the costæ are either (i.) low, extending to the foot of the corallites—those of the primaries, and sometimes of the secondary septa, standing further out from the wall than the rest—or (ii.) they are subequal, or (iii.) they are wanting (on one part of a corallite). The

columella is composed of minute, rather contort, and sublaminar papillæ, to which the interior and inferior terminations of some of the secondary and tertiary septa (and rarely the primary also) contribute a very thin horizontal laminar ridge or foot, which is minutely dentate in the case of the secondary and tertiary septa. This ridge is a "paliform lobe" in a most rudimentary condition, and in some cases can be called no more than the inward prolongation of the lower margin of the septa. The septa occur in four cycles, of which the fourth is frequently wanting; the primaries rise nearly 1 millim. above the wall, slope off gradually towards the middle of the calicle, and their inner edge falls almost perpendicularly downwards from a point which is about on a level with the margin of the wall, where the septum is about 1.25-1.5 millim. wide; the sides are finely striated; the secondaries may project about .3 millim. above the margin, but both these and the tertiaries scarcely project inwards at their upper termination at all, but slope off gradually by concave margins until they join the columella as above described; the quaternaries also project but slightly into the interseptal spaces, and either fall almost perpendicularly at once into these spaces, where in some cases they may be seen extending a horizontal lamina towards the columella at a considerable depth, or attach themselves laterally to the adjoining septa. All the septa resemble tissue-paper in their thinness, and the secondary, tertiary, and quaternary have fine but prominent granules on their faces; the primaries and secondaries and the upper parts of the rest have the margin entire; the subhorizontal inner portion of the tertiaries is finely dentate. Verrill's specimens and those in the British Museum from Punta Arenas agree with each other, and differ from the Malacca specimens in the granulated (not striated) condition of the primary septa, and the variability in extent of the columella, and in the occasional minute denticulation of the edge of the primary septa. Even allowing for individual differences and the possible influence of depth, this species must be distinguished from *papuensis* by the inequality of the costæ, the minute numerous papillæ of the columella, and the rudimentary condition of the paliform lobes.

I would call attention to two points in this species, viz. (1) the variability of the costæ (*a*) as regards actual prominence, viz. from practical absence to moderate development, and (*b*) as regards relative prominence, viz. from a subequal condition to one in which

the upper parts of the primary and secondary costæ much exceed the others; (2) the occurrence in some individual corallites of some teeth on the margins of the largest septa (Verrill gives "sub-entire primary and secondary" septa as a generic character for *Phyllangia*, Tr. Conn. Acad. i. p. 532; and in *Astræidæ* proper the dentation or not of the septal margins is employed by Milne-Edwards and Haime to separate the *Eusmilinæ* from the *Astræinæ*).

The few points above noted being too slight or too variable to distinguish the Malacca specimens from those found on the west coast of America, the known distribution of *P. dispersa* assumes the following remarkable condition:—

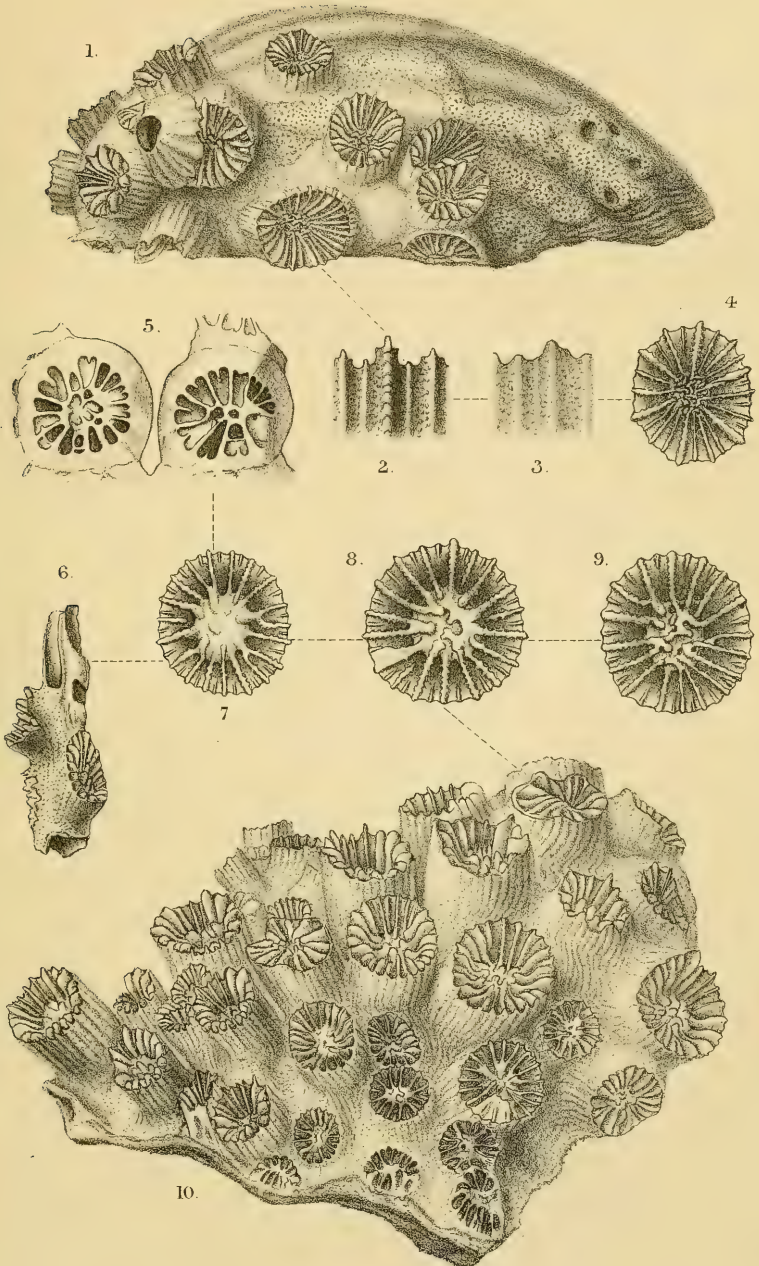
Hab. Panama and Pearl Islands, W. coast of America (Verrill); Punta Arenas, Central America (*coll. Mus. Brit.*); Malacca (*coll. Mus. Brit. ex coll. Belcher*).

The Malacca specimen was (perhaps partly on distributional grounds) originally identified as *P. papuensis* in the National collection.

I lay these observations before the Society feeling that it is only by careful observation and record of the constancy or inconstancy of the different characters in different groups that right principles can be obtained for the distinction of genera and species.

DESCRIPTION OF PLATE XVI.

- Fig. 1. *Phyllangia dispersa*. Specimen from Malacca, upon valve of *Cardita*, which also supports an incrusting Polyzoon. $\times 2$ diam.
2. The same. Part of the outer surface of a calicle from this specimen showing well-marked costæ. $\times 6$ diam.
 3. The same. Part of the outer surface of a calicle from same specimen, showing costæ merely indicated. $\times 6$ diam.
 4. The same. A calicle from same specimen, as seen from above. $\times 3$ diam.
 5. *Phyllangia papuensis*. Basal view of two calicles, from fragment of colony scaled off anchor from Amboyna, showing the characters and distribution of the dissepiments. $\times 3$ diam.
 6. The same. Part of a colony modified by growth around a seaweed or hydroid stem. $\times 2$ diam.
 - 7, 8, 9. The same. Three calicles from large colony from Amboyna (fig. 10), as seen from above, to show range of variation in the columellar mass. $\times 3$ diam.
 10. The same. Fine colony, showing great range in height of calicles and characters of the columellar mass. $\times 2$ diam.
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Berjeau & Highley
del et lith.

1-4. *PHYLLANGIA DISPERSA*.
5-10. *P. PAPUENSIS*.

Mintern Bros. imp.